United Kingdom of Great Britain and Northern Ireland

Certificate of EC type-examination of a measuring instrument
Number: UK/0126/0014

issued by the Secretary of State for Innovation, Universities and Skills
Notified Body Number 0126

In accordance with the requirements of the Measuring Instruments (Liquid Fuel delivered from Road Tankers) Regulations 2006 (SI 2006/1259) and the Measuring Instruments (Non-Prescribed Instruments) Regulations 2006 (SI 2006/1270) which implement, in the United Kingdom, Council Directive 2004/22/EC, this certificate of EC type-examination has been issued to:

Alpeco Ltd
Chinnor Road
Bledlow
Princes Risborough
Buckinghamshire, HP27 9PH
United Kingdom

in respect of a vehicle mounted liquid fuel meter measuring instrument having the following characteristics:

Model designation	*Truck Metering System*
Maximum rate of flow	*1100 litres / minute*
Minimum rate of flow	*40 litres / minute*
Maximum operating pressure	*10 bar*
Minimum delivery	*500 litres pumped* *1000 litres gravity*
Liquids measured	*Derv; Gas oil; Kerosene, Paraffin; Gasoline; Diesel; Domestic heating oils*

The necessary data (principal characteristics, alterations, securing, functioning etc) for identification purposes and conditions (when applicable) are set out in the descriptive annex to this certificate.

Signatory: P R Dixon
for Chief Executive
National Weights & Measures Laboratory
Department for Innovation, Universities & Skills
Stanton Avenue
Teddington
Middlesex TW11 0JZ
United Kingdom

Issue Date: 28 September 2007
Valid Until: 27 September 2017
Reference No: T1121/0014

Descriptive Annex

1 INTRODUCTION

This pattern is a meter measuring system fitted to a road tanker for the transport and delivery of liquids with low viscosity and stored at atmospheric pressure.

It comprises a multi-compartment tank, an optional multi-compartment manifold pipe and valve system, a pump, an optional filter, a meter, gas separator and compatible ancillary equipment.

The system may be fitted with:

One full hose reel and one empty bulk hose system, which is cleared of product at the end of the delivery by a 'blow-down' system. Hydraulic system diagrams are shown in Figure 1 and Figure 2. A general view of a typical system is shown in Figure 8. The system allows:

(i) Metered delivery by pumping (full hose or empty hose)
(ii) Direct un-metered delivery (with or without pumping) and emptying and filling of the cargo tank, without passing through the meter.

Alternatively the system may be fitted with:

One empty hose reel system and an optional empty bulk hose system whereby both hoses are cleared of product at the end of the delivery by a blow-down system. The hydraulic system diagram is shown in Figure 3.

The system allows:

(i) Metered delivery by pumping (empty hose reel and or empty Bulk hose)
(ii) Direct un-metered delivery (with or without pumping) and emptying and filling of the cargo tank, without passing through the meter.

2 FUNCTIONAL DESCRIPTION

2.1 Mechanical

2.1.1 Hydraulics

The hydraulics system diagrams illustrating the various options are shown in Figure 1. With reference to Figure 1, liquid may flow from any of the selected compartments of the cargo tank via the appropriate foot valve to the optional manifold. From there it passes through an optional 2-way valve, R1, which allows metered delivery, un-metered delivery and emptying and filling of the tank without passing through the meter. An outlet valve, Vm, on the downstream side of the optional pump permits un-metered pumped delivery. Metered deliveries pass through an optional filter F2, gas separator GS and meter C. Operating valves, Vm, select bulk or hose-reel delivery.

2.1.2 Gas elimination devices

The system may be fitted with one of the following gas elimination devices.

2.1.2.1 Gas extractor

This is a Liquid Controls gas extractor type A8100 as described in EEC certification No UK81 1783. A Liquid Controls filter unit is fitted directly to the gas extractor on its upstream side. Gas from the air extractor is vented directly to the cargo tank via a one-way valve, or optionally, to a liquid catchment tank. The catchment tank is fitted with a vent valve and a drain valve.

2.1.2.2 Combined gas separator and pump

This is a Mouvex DMX gas separator as described in EEC Cert. No. F99.00.522002.0 combined with a Mouvex CC 8.50 vane pump (Figure 10). The unit also contains a filter, a flow regulator and a flow detector. A two-way valve selects bulk or measured deliveries. The unit will automatically change to low flow rate during closing of the nozzle and there is automatic pressure reduction during bulk discharge at high flow rate. Degassing occurs before filtering and pumping.

2.1.3 Meters

The system may be fitted with one of the following meters.

Manufacturer	Model designation	Reference
Liquid Controls	M-7	EEC certification No UK81 1782
Liquid Controls	M-15	EEC certification No UK81 1782
Liquid Controls	M-25	EEC certification No UK81 1782

These meters are fitted with a pulse output device (Figure 7). Where bulk deliveries are un-metered, the 2-way valve shown in Figure 9 is not required.

2.2 Electronics

2.2.1 S.A.M.P.I s.p.a TE550 electronic calculating / indicating device

The TE550 is a programmable electronic register, usable for applications for up to four meters with a pulse generator. The TE550 counts the number of pulses received from the pulse output device on the meter and uses a stored calibration value (pulse per litre) to calculate the metered volume of liquid. The equipment comprises of three main parts, The LKI display panel (Figure 6) the CPU module (Figure 5) and Epson TM-U295 slip printer (Figure 4).

The construction of the CPU module may vary according to where it is mounted on the vehicle, i.e. in the cab or externally mounted somewhere on or under the vehicle chassis. In either case the CPU module houses the following components and is wire sealed to prevent unauthorised access.

CPU board	320 220 1864
CMOD board	320 220 1862
24PS board	320 220 1866
I/O board.	320 220 1867

The LK1 Display panel (S50050-) can be mounted anywhere on the vehicle as long as it is clearly visible and accessible to the user.

The Epson printer (TM-U295) is generally mounted independently in the cab.

The solenoid control box is chassis mounted (See note).

Note: The part number assigned to general items such as the solenoid control box, are issued on completion of build, under the control of Alpeco quality system.

The pulser is connected to a terminal block inside the LK1 display housing which is generally mounted on the side of the vehicle in a protective enclosure.

The quadrature pulse output from the pulser is fed through the LK1 to the CPU which is housed in the main enclosure. The latter produces a calibrated pulse output by combining the pulse stream with a calibration factor. When the required amount of liquid has passed through the meter, the CPU will output a signal to stop delivery.

The keyboard on the front of the LK1 display is the primary means of entering setup, delivery, pricing and calibration information into the system, and to start and stop delivery. It is connected to the main CPU by double insulated cable.

Delivery tickets are printed on an Epson TM 295 dot matrix printer, which is also connected to the main CPU.

2.2.2 Power supply

The TE550 is powered by the vehicle battery. In the event of failure of this power source, a lithium battery backup retains all the pertinent data until the principal power supply is restored.

2.3 Interlocks and security features

Legally controlled metrological parameters may be changed after breaking of a seal and setting of a switch on the LKI board inside the display. Any changes to the legal parameters are permanently stored in memory. The legally controlled parameters and the mandatory settings are listed in 2.3.1.

Information memorized, in this case, is:

- Date and time of the calibration
- ID of the user that performed the calibration
- List of the modified parameters

The electronic register can memorize the history of the calibration performed up to a maximum of 5000 modified parameters; with a limit of 500 parameters per calibration session (further modifications will not be included in the history).
The TE550 will stop the measurement if any error codes or alarms are generated.

(i) If missing or extra pulses are received from the pulser, or there is a channel failure, delivery is terminated and a ticket is printed indicating “PULSER REVERSAL FAILURE STOP”. The number of missing or extra pulses (pulser reversals) is preset by the manufacturer and corresponds to the quantity of product shown below:

Meter	No of pulser reversals	No of pulses/L	Qty of product
M-25	30	217	0.5L
M-15	30	217	0.5 L
M-7	75	583	0.5 L

The number of pulses per litre can be checked in the calibration mode, Parameter 204.

(ii) The presence of the printer is continuously monitored by the TE550. If the printer is disconnected or does not have a ticket inserted in it, then initiation of delivery will not be permitted and an error message will be displayed on the LK1 display. If the connection is broken during a delivery, the delivery can be completed but an error message will again be displayed on the LK1. However, no further deliveries can be made until the printer is reinstated and the ticket for that delivery is printed from data retained in the memory.

(iii) The TE550 calibration contains a no-flow timeout facility. The delivery is terminated and a ticket is printed if product delivery stops and does not recommence within a preset period of time. This is to prevent a partial delivery being made elsewhere. The no-flow timeout can be programmed to10 minutes maximum; its value can be viewed at Parameter 42 in the calibration menu.

(iv) When the optional manifold is present, means shall be provided to prevent transfer of liquid between compartments by adequate footvalves, faucet valves, non-return valves or interlock mechanisms. The manifold may be controlled via optional software installed within the TE550.

2.3.1 Legally controlled parameters

Parameter	Function	Setting
002	Register address	Correct address
003	Number of meters	Correct number
020	Management of encoder error	MENU M - - DECREASING
021	Erroneous rotation impulses management	“message” or “spurious”: also refer to parameters 024 and 025
024	Number of false pulses for error	Depending on the minimum batch; to be accounted for by the manufacturer or user.
025	Number of good pulses to decrease the spurious counter	Depending on the minimum batch; to be accounted for by the manufacturer or user.
032	Number of decimals for the volume(s)	0, 1, or 2. When a price is displayed as well, 2 shall be applied.
033	Number of decimals for the preset	In case of volume preset not smaller than parameter 032
071	Volume unit	Litres
075	Date format	
Meter parameters		
201	Meter cyclic volume	Correct figure
202	Encoder type	Phase squaring
204	Number of impulses per encoder turn	Correct figure

210	Minimum flow rate	Depending on the application; to be accounted for by the manufacturer
211	Maximum flow rate	Depending on the application; to be accounted for by the manufacturer
434 (meter 4only)	Printing product name	Enable: only applicable when an approved printer is connected.
Product (n)		
601	Static meter error (necessary for linearization curve)	Depending on the application; to be accounted for by the manufacturer
602…611 (1) 635…644 (2) 668…677 (3) 701…710 (4) 734…743 (5) 767…776 (6) 800…809 (7) 833…842 (8) 866…875 (9) 899…909(10) 932…941 (11) 965…974 (12)	Flow rates for the linearization curve	Depending on the application; to be accounted for by the manufacturer
612…621 (1) 645…654 (2) 678…687 (3) 711…720 (4) 744…753 (5) 777…786 (6) 810…819 (7) 843…852 (8) 876…885 (9) 910…919 (10) 942…951 (11) 975…984 (12)	Corrections for the linearization curve	Depending on the application; to be accounted for by the manufacturer
622	Product coefficient alpha	Only applicable if parameter 015 is set to “ALPHA”. Depending on the application; to be accounted for by the manufacturer
625	Product name	Correct name

3 TECHNICAL DATA

3.1 Metrological parameters

	Meter			
	M-25	**M-15**	**M-7**	
Accuracy class	0.5	0.5	0.5	
Maximum rate of flow:	1100	900	450	litres / minute
Minimum rate of flow:	110	90	45	litres / minute
Maximum working pressure:	10.5	10.5	10.5	bar
Minimum delivery :	500	500	500	litres

Liquids measured:	Liquid petroleum products of low viscosity (<20 mPa·s) except LPG.
Climatic environment:	-10 °C to +40 °C Open, condensing
Electromagnetic environment:	E3
Mechanical environment:	M2 (vehicle mounted)

Note: The maximum rate of flow, however, must not be greater than the maximum rate of flow of any component of the system.

3.2 Supporting documentation

MA_84 Rev. 00	Installation, use and service manual
MA_64	Communication protocols
SE_83	Interconnecting wiring diagram
SE_84	Internal wiring diagram

3.3 Software

The software version number is CT-001-550-001-XX. (XX can be any number)

4 PERIPHERAL DEVICES AND INTERFACES

4.1 Interfaces

The instrument may have the following interfaces:

(i) Connection to an Epson TM295U dot matrix slip printer
(ii) Electro-pneumatic interface to the manifold/footvalve pneumatic control system.
(iii) Electro-mechanical interface to the Product return and Checkmate anti cross-over system.

4.2 Peripheral devices

The instrument may be connected to any peripheral device that has been issued with a test certificate (evaluation certificate) by a Notified Body responsible for Annex B (MI-005) under Directive 2004/22/EC in any Member State and bears the CE marking of conformity to the relevant directives; or

A peripheral device without a test certificate may be connected under the following conditions:

- it bears the CE marking for conformity to the EMC Directive 89/336/EEC;
- it is not capable of transmitting any data or instruction into the measuring instrument, other than to release a printout, checking for correct data transmission or validation;
- it prints measurement results and other data as received from the measuring instrument without any modification or further processing; and
- it complies with the applicable requirements of Paragraph 8.1 of Annex I.

5 OPERATION

5.1 Normal delivery

At the start of a delivery a ticket must be inserted into the Epson printer in order to be able to program the TE550 with the delivery requirements and start the delivery, if a ticket is not inserted the ERROR CODE 013 will be displayed. Once the ticket is inserted a series of dialogue boxes will prompt the operator to enter delivery details in to the TE550 via the display key pad. (See P.54 of operator manual).

1. Select product to be delivered from drop down menu and press ENTER – Products marked DERV RET etc are for Product return only.
2. If applicable (Select compartment to be delivered from 1 – 6)
3. If applicable (Select delivery method Hosereel or Bulk)
4. Enter volume of product required (Preset)
5. Press F1 to start delivery (F2 to stop)
6. On completion of delivery press F2 to print or leave for automatic time out print.
7. Select yes or no to the prompt “Duplicate ticket?”

5.2 Product return

5.2.1 The system is designed to allow product to be returned to a compartment to permit the changeover of product following the completion of a delivery, but to inhibit product return unless the following conditions are met:

For product changeover or transfer, the wet-hose nozzle is connected to the product transfer valve **Pt** (Figure 1), which incorporates a non-return valve. A ticket must then be inserted into the ticket printer and the master control switch **Ms** (in the control box **Cb**), is then pulled to activate the product return system. The compartment, to which product is to be returned, is selected using the rotary selector valve **Rc**. **Rc** allows selection of and opens an individual product transfer valve **Pt** to allow product to flow to the selected compartment. The Product return delivery is then programmed in to the TE550 as follows:

1. Select product to be returned from drop down menu – Only Products marked DERV RET etc can be selected otherwise PRS will not operate.
2. If applicable (Select compartment to be delivered from 1 – 6)
3. Enter volume of product to be returned (Preset)
4. Press F1 to start delivery (F2 to stop)
5. On completion of delivery press F2 to print or leave for automatic time out print.
6. Select yes or no to the prompt "Duplicate ticket?"

5.2.2 When the product return is complete, the meter pre-set shuts off product flow and the hose-end nozzle is manually closed. The blow-down button **Bd** is manually depressed, which opens poppet valve **Pv**. This allows compressed air from the air tank **AT** to purge product from the bottom-loading pipework from **Pt** back into the compartment. Duration is approximately 7 seconds. The master control switch **Ms** is then closed to deactivate the product return system.

5.2.3 Security features and interlocks

5.2.3.1 Product cannot be diverted into a compartment via a product transfer connector during a normal delivery because the product transfer valve **Pt** will remain closed If, during a normal delivery, the product return master control switch, **Ms**, is pulled, the delivery will stop and a ticket will automatically be printed. An Error code 600 will be displayed by the TE550

6 APPROVAL CONDITIONS

The certificate is issued subject to the following conditions:

6.1 Legends and inscriptions

6.1.1 The instrument bears the following legends:
'CE' marking
Supplementary metrology marking
Notified body identification number
Accuracy class
Serial number
Manufacturers mark or name
Certificate number

7 LOCATION OF SEALS AND VERIFICATION MARKS

The following shall be sealed to prevent unauthorised adjustment or dismantling:

7.1 Pulse output device

The pulser is sealed along both sides as shown in Figure 9. The wire through the rear drilled bolt also prevents removal of the POD from the meter housing.

7.2 TE550

(i) CPU Module Figure 5 (This enclosure may vary depending on internal or external mounting in either case the enclosure should be sealed to prevent unauthorised access and tampering.) the printer is generally mounted in the vehicle cab.

(ii) LKI indicator enclosure housing the calibration switch as shown in Figure 6

7.3 A8100 Gas eliminator

At least one of the vent pipes from the gas extractor shall be protected, by seals if necessary, from being closed or obstructed in any way.

7.4 Gas separator/pump DMX

(i) Air pipe (signal to pump) via sealed copper compression fittings.
(ii) DMX unit to pump. Drilled flange bolts seal this.
(iii) Pump. The bypass pneumatic control is sealed by drilled fittings.
(iv) 2-way valve. Lead plugs seal the valve body.

7.5 Meters

The covers of the meter housing and the calibrating mechanism shall be sealed to prevent unauthorised adjustment or dismantling.

8 ALTERNATIVES

There are no alternatives.

9 RECOMMENDED TESTS

9.1 Ensure that a product return cannot take place unless a product designated DERV RET, GAS RET KERO RET or Other RET is selected when the Product return master switch is pulled out.

9.2 Check that the delivery is terminated if the product return master switch is pulled during a normal delivery.

10 ILLUSTRATIONS

10.1 KEY TO HYDRAULIC DIAGRAMS

10.1.1 Key to Figure 1

SgP	Gas separator combined with supply pump
R2	Optional two way valve for direct un-metered delivery, un-metered delivery
R1	Optional two way valve allowing metered delivery, un-metered delivery and emptying and filling of the tank without passing through the meter
MVV	Manifold vent valve.
P	Optional pump with auxiliary devices
F2	Filter
GS	Gas separator with gas release
FV	Compartment foot valve
FC	Faucet valve
M	Optional manifold where this is fitted means are provided to prevent transfer of liquid between compartments by adequate foot valves, faucet valves, non-return valves or interlock mechanisms.
Cl	Optional non-return valve
V3	Sight glass serving as a gas indicator
R3	Device allowing deliveries to be made by either of two available methods
Vm	Operating valve
V2	Sight glass serving as a product indicator
FL1	Full hose on reel
FL2	Optional full on hose reel
PGS	Gas extractor
V4	Sight glass of gas extractor
B	Optional bypass allowing metered gravity-feed delivery (empty hose). This bypass is authorised only if there is no valve r1
A	Anti-swirl device
F	Filter/strainer
At	Optional air vent (blow down)
V1	Weir type sight glass
T1	Vessel to catch liquid particles entrained by the gases
T2	Return to tank
T3	Blow off valve
C	Meter
Cla	Valve preventing the full hose from emptying
Va	Valve automatically closed by the gas extractor when the pressure is insufficient to prevent vapourisation in the meter or when a gas pocket accumulates in the extractor. In addition, this valve must close in the event of a failure in its control system. Variants of the delivery device : I; II; III: I : one or two full hoses II : one or 2 empty hoses III : combinations of one full and one empty hose or one empty hose.

10.1.2 Key to Figure 2

At	Air Tank
Bd	Blowdown valve
Cb	Control Box
Nr1	Non Return Valve
Nr2	Non Return Valve
Ps1	Pilot Operated Valve
Ps2	Pilot Operated Valve
Ps3	Pilot Operated Valve
Ps4	Pilot Operated Valve
Tm	Timer
R1	A two-way valve to deliver product with or without metering and to empty or fill the tank without passing through the counter. This optional valve can be replaced by a direct connection. The conduit linking the pump to the two-way valve controlling direct deliveries must have an internal volume no greater than 3 litres.
F	A filter incorporated in the DMX gas separator or standard filter
SgP	MOUVEX DMXIII combined gas separator and pump, approved by Cert. No. F99.00.522 003.0.
Pg	Gas Extractor as approved in EECUK81 1783
cl1	A non-return valve that can be mounted downstream of the meter. Optionally, this valve can also act as a flow detector (FD).
R2	Type MF two-outlet valve SBL to allow direct delivery without metering. This valve is optional. If fitted, the "MF" variant of the DMX gas separator is required.
C	Meter.
I	Combination of one empty hosereel and one empty bulk hose.
II	One empty hosereel.
V²	Sightglass also serving as a gas indictor.
Vm	Operating valve, which can be pneumatically controlled; if pneumatic control is used, the operation of the valve can be slaved to that of the DMX separator.
R3	A valve with two outlets in which the three orifices cannot be simultaneously connected together and which ensures the outlet used cannot be changed during metering.
cl²	Non-return valve.
fl1	Empty hose reel
R	Two way valve to allow direct delivery unmetered on standard gas extractor system
Vft	Compartment Foot Valve
Vfc	Faucet Valve
M	Optional Manifold. Where this is fitted means are provided to prevent transfer of liquid between compartments by adequate foot valves, faucet valves, non return valves or interlock mechanisms.
T1	Return to Tank
T2	Catch Tank
V1	Overflow sightglass
MVV	Manifold vent valve
X	Meter system X which incorporates Pg Gas extractor should not be installed in conjunction with Manifold M
Y	Meter system Y which incorporates SgP Gas separator can be installed in conjunction with either Faucet valve Vfc or Manifold M

10.1.3 Key to Figure 3

At	Auxiliary air tank
Bd	Blowdown valve
Cb	Product return system control box
Ms	Master control switch
Ps	Pneumatic valve
Pt	Product transfer valve
Pv	Poppet valve
Rc	Rotary valve

Figure 1 Hydraulics
Figure 2 Hydraulics (options)
Figure 3 Hydraulics Product return system.
Figure 4 TE550 electronic control system, cab mount CPU module.
Figure 5 Example of CPU module for external mounting wire sealed to prevent unauthorised opening
Figure 6 LKI display panel.
Figure 7 Pulse output device showing sealing.
Figure 8 View showing TE550 units fitted to tanker
Figure 9 2-way valve sealing
Figure 10 Mouvex DMX gas separator
Figure 11 General view of product return system

11 CERTIFICATE HISTORY

ISSUE NO.	DATE	DESCRIPTION
UK/0126/0014	28 September 2007	Type examination certificate first issued.

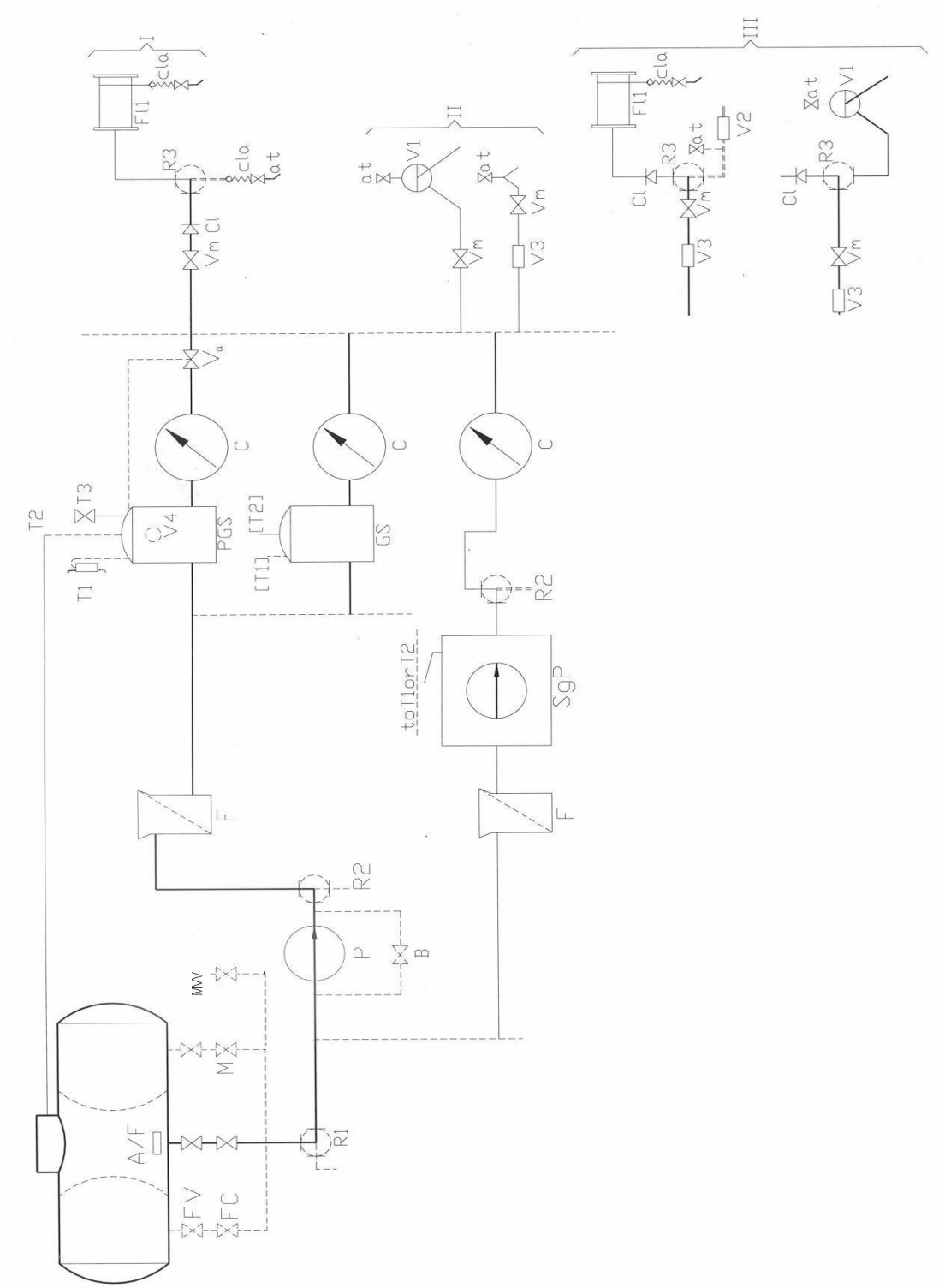

Figure 1 Hydraulics schematic

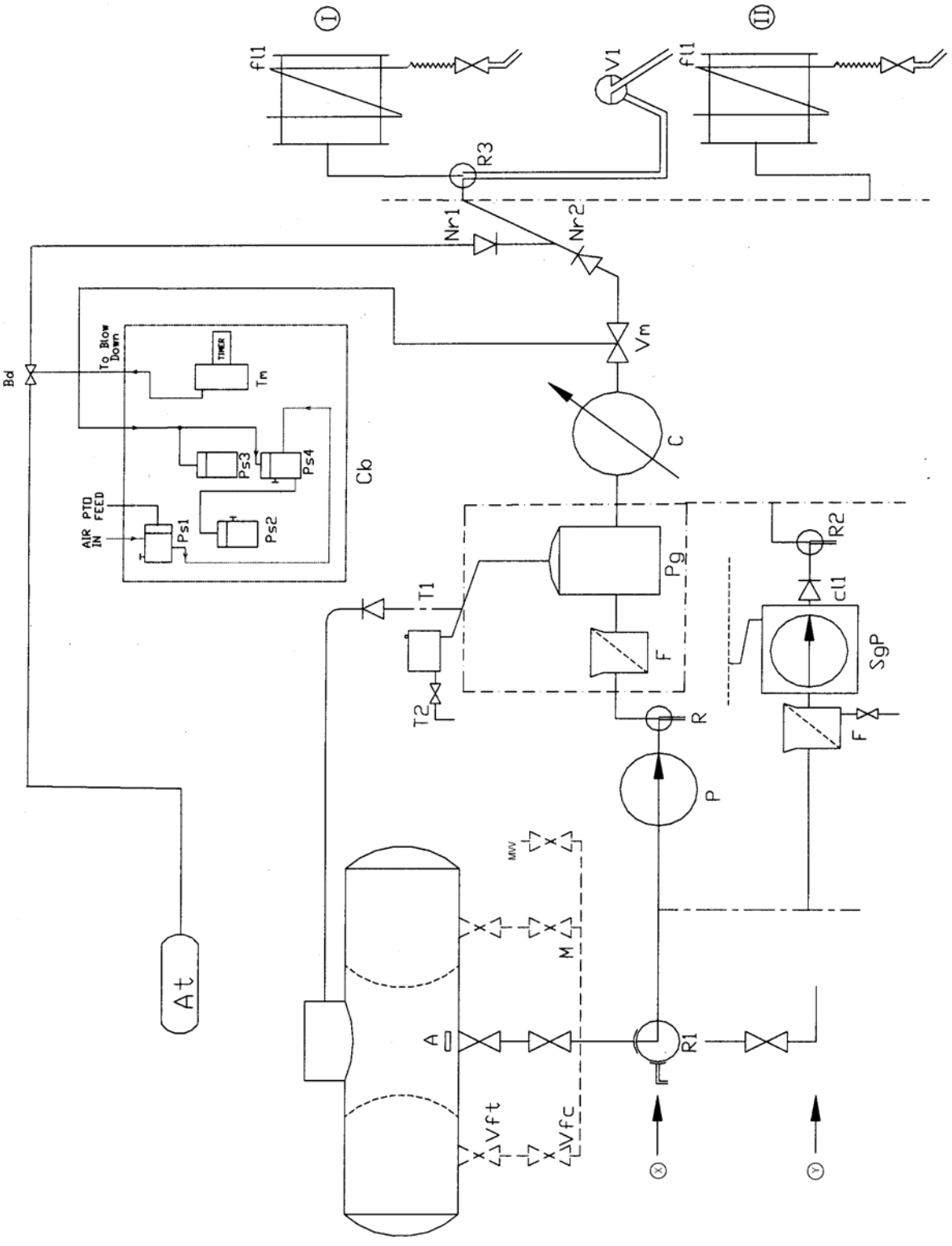

Figure 2 Dry line system variants

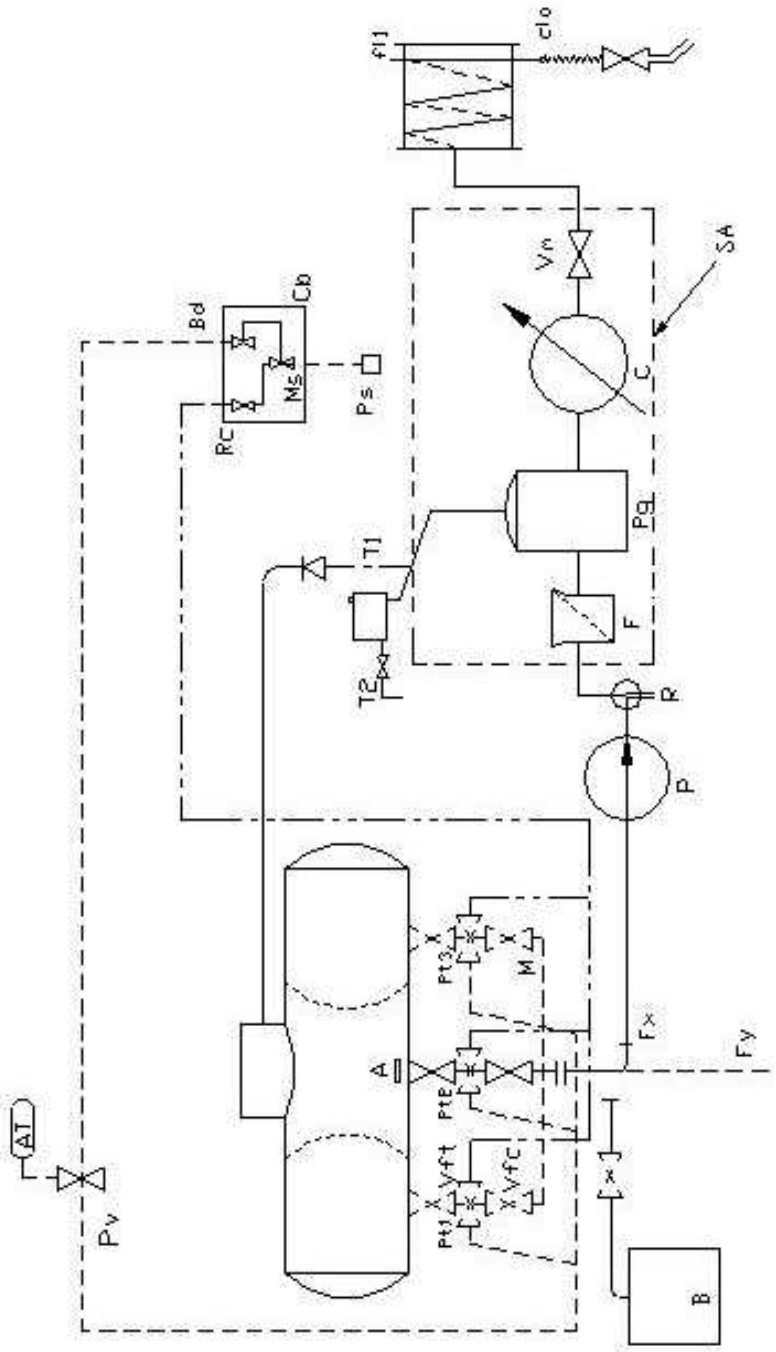

Figure 3 Product return

Figure 4 TE550 electronic control system, CPU module for cab mounting.

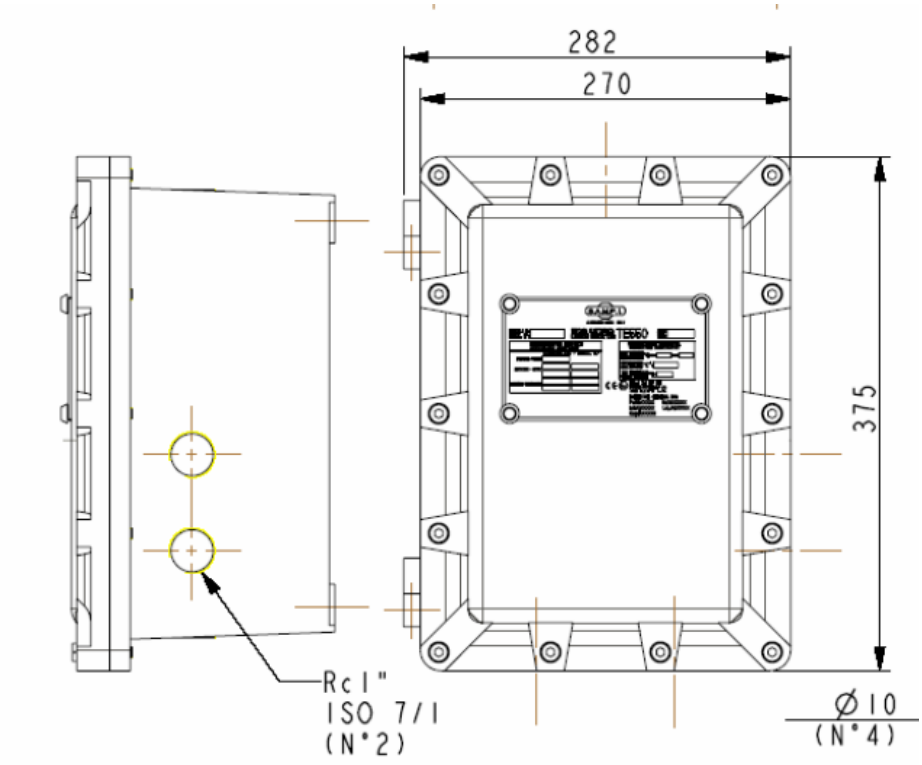

Figure 5 Example of CPU module for external mounting wire sealed to prevent unauthorised opening

Fig 6 LKI display panel

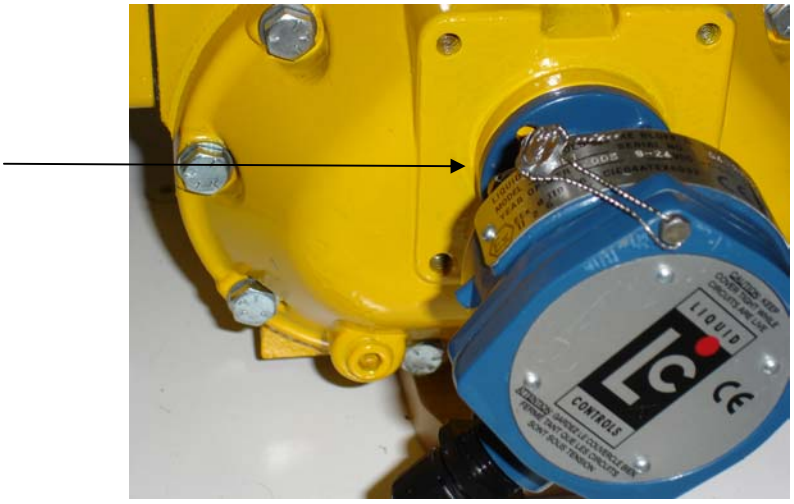

Figure 7 Pulse output device showing sealing

Figure 8 View showing TE550 unit fitted to tanker

Figure 9 2-way valve sealing

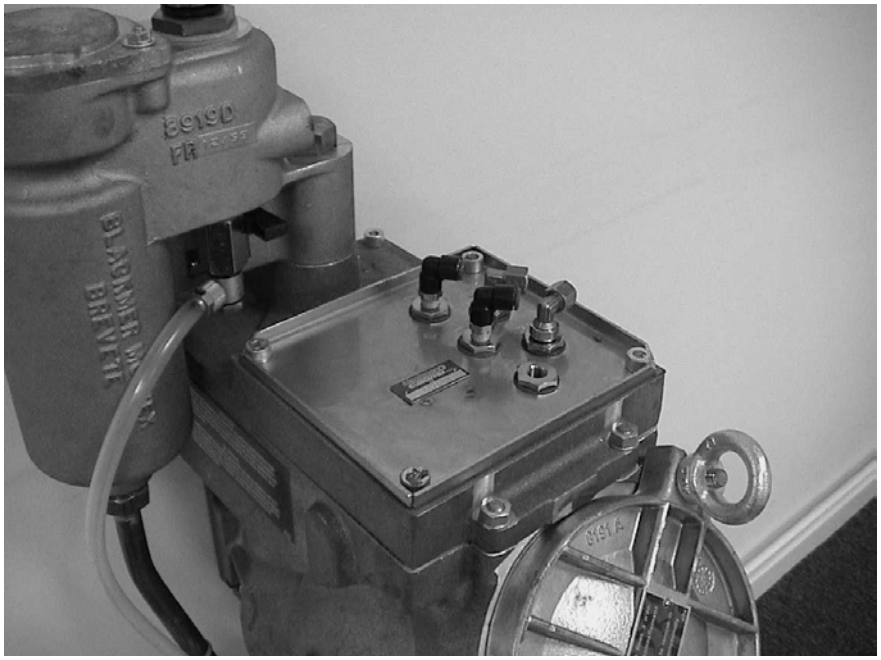

Figure 10 Mouvex DMX gas separator

Figure 11 General view of product return system

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